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Israeli Defense Fōhœ€4l Branch C4l Technology Division

Lessons Learned from Establishing the IDF C4I Architecture

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Outline

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Background

- IDF has developed a new conceptual template for achieving better effectiveness in a rapidly changing environment
- The Command, Control, Computers, Communication and Information (C4I) Branch was established in March 2003
 - The mission: "to enhance the effectiveness of the IDF"
 - The vision: "Air, sea and land forces that fight as one force in all warfare scenarios"
- Current C4I systems do not allow the enterprise to maximize their potential, in order to achieve information superiority

Problem Statement

There is no IDF C4I architecture:

- Inflexibility in answering changing operational requirements – unsynchronized C4I efforts lead to difficulties in adapting C4I solutions to changing operational requirements
- No senior management planning tools an inability to examine the suitability of new C4I efforts to the IDF objectives. An inability to simulate scenarios of competing C4I efforts and how they will influence the IDF
- Inventing the wheel each C4I project solves architectural problems from scratch. Each project chooses its own technological standards, creating a growing integration problem

The Work Process

The C4I Branch has chosen DoD AF as the methodology for describing its C4I architecture

- It is a methodology that describes an enterprise suitable for describing a collection of systems in an organization and their relations
- The methodology is appropriate for a military organization – It starts with an "Operational View" (the equivalent to business processes and requirements) in other methodologies
- It is an iterative methodology It allows one to build some products before completing all preceding products. This feature is crucial when building architecture for a large and complex organization in a reasonable time

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The Work Process Phases

Phase A: current (As-Is) architecture for C4I systems in the IDF

- Describing existing C4I systems
- Existing relationships between these systems
- The main dilemmas/pitfalls of current situation
- Phase A did not include analysis of the operational view (OV)
- Phase B: future (To-Be) architecture
 - Describing future C4I systems
 - Desired relationships between these systems
 - Solutions to the dilemmas/pitfalls raised in the previous step
 - Two steps: Inc. 1 a three- to four-year framework and a vision framework looking ten years ahead

• Phase C: transformation plan

- Required steps to get from the current to the desired (Inc. 1) architecture
- Including resources needed for the transformation, and effects



Working Teams

Connectivity architecture team

- Operational connectivity architectur
- Tactical connectivity architecture
- Support systems connectivity architecture

Application architecture team

- Application layers concept
- Data warehouses architecture

• Systems infrastructure team

- Data centers architecture
- Infrastructure services architecture
- Mobile user connectivity architecture

Network and communications infrastructure team

- Transmission infrastructure
- Data networks architecture
- Voice networks architecture
- Multimedia applications architecture
- Monitoring architecture



Network & Communication Infrastructure

Integration Team

- The teams had to work in parallel
- Dependencies problems
 - Dilemmas raised in one team often required a solution by another
 - A concept one team proposed usually required a concept change in other teams
 - Common dilemmas incorporated experts from different layers
- The solution was to put together an integration team
 - Led by the CTO of the C4I Branch
 - Guide the teams, design the process templates
 - Workout the dependencies between the teams
 - Its final task was to create the integrative desired "e-IDF" architecture, and overall transformation plan

Common Joint Template



As-Is Architecture – Example



To-Be Architecture – Example



Lessons Learned

"Common language"

- Define a common template
- Enables work in parallel
- Easy integration
- The lesson is to define in advance a "common language" template that enables integration of all products into a single coherent architecture

Using representative systems

- Choose systems representing the organization
- Maintain a reasonable level of complexity
- The lesson is to use representative systems in places where analyzing large numbers of systems clutter the resulting architectural picture

Lessons Learned

Focus on current architecture dilemmas

- Analyze all dilemmas, but choose only a few of them for the next phase
- The lesson is to focus the work of the teams working on the To-Be architecture using a small number of dilemmas from the As-Is architecture

Automated products integration

- Use a computerized tool to manage a common dictionary containing the terms and definitions used by the entire working group
- Existing tools (including the tool we used) "do not know" how to automatically integrate the different viewpoints of the architecture into one architectural picture
- The lesson is to experiment with developing a tool for automated integration of the architectural picture

Lessons Learned – the Work Process

Separating the As-Is products from the Operational View

- Base the As-Is architecture on high level operational concept product (OV-1)
- Allows the systems view (SV) teams to move on
- The lesson is to use an iterative methodology allowing work on some products before preceding products have been completed. To-Be systems architecture can be built without detailed operational processes, especially when constructing the network and communication infrastructures architecture

"Common language"

- Set up a common data base to be used by all teams
- The lesson is maximum transparency and constant information sharing between the teams

Lessons Learned – the Work Process

Resolution

- Define the efforts resolution level
- The single "system" was defined as the "atom" element
- There was no "drill down" to the level of the subsystem. The focus was on the relationships between the systems
- The lesson is to set one common level of detail for the entire architectural effort

Lessons Learned – the Work Process

Difficulty in defining the architectural effort client

- Define as part of the process different usage scenarios, so each potential client can associate with the process
- The lesson is to define beforehand the clients that will be using the architecture products and how they will be using them

Accompanying integration process

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- Hold weekly meetings in order to expose and solve all the conflicting topics
- Select the right panel for the integration team: each of the teams should be represented by a senior member
- The lesson is to closely direct the process with an integration team in order to maintain a holistic soons Learned from Establishing the IDF C4I Architecture

Recommendations

 Analyze a small number of representative operational processes

- Suggest a broad solution, able to support a variety of operational needs
- Focus on connectivity (technical) standards first

Future Activities

A transformation plan

- A gradual plan setting the path from current architecture to the To-Be Increment 1 architecture
- The plan will be updated according to new C4I efforts completed each year

Standards definition work plan

- A perennial work plan for defining the various standards for building C4I systems
- These standards will become mandated within the IDF (internal and out-sourced efforts) from now on. The work plan focuses on connectivity standards